LIST OF CONTENTS

Number 1

L. Lundström, T. Salmi, J. Lehtonen, L.P. Lindfors, S. Toppinen and **J. Aittamaa**	1	Modelling of speciality chemicals production in liquid–liquid reactors—A case study: synthesis of diols
L.U. Kreul, A. Górak and **P.I. Barton**	19	Modeling of homogeneous reactive separation processes in packed columns
N.L. Filippova	35	Adsorption isotherms on planar surface under flow conditions by ellipsometry
Y. Ma and J.-X. Zhu	41	Experimental study of heat transfer in a co-current downflow fluidized bed (downer)
J. Alvarez-Ramirez and **R. Suárez**	51	A control scheme for a class of uncertain linear plants
T.C. Thulasidas, M.A. Abraham and **R.L. Cerro**	61	Dispersion during bubble-train flow in capillaries
G. Marbán, M. García-Calzada and **A.B. Fuertes**	77	Kinetics of oxidation of CaS particles in the regime of low SO_2 release
V. Blet, Ph. Berne, C. Chaussy, S. Perrin and **D. Schweich**	91	Characterization of a packed column using radioactive tracers
S. Charton, J.P. Corriou and **D. Schweich**	103	Modeling of hydrogen isotopes separation in a metal hydride bed
Ö. Şahin and **A.N. Bulutcu**	115	Dehydration kinetics of sodium perborate tetrahydrate to monohydrate in a fluidized-bed drier
R.D. Vas Bhat, W.P.M. van Swaaij, J.A.M. Kuipers and **G.F. Versteeg**	121	Mass transfer with complex chemical reaction in gas–liquid systems—I. Consecutive reversible reactions with equal diffusivities
R.D. Vas Bhat, W.P.M. van Swaaij, J.A.M. Kuipers and **G.F. Versteeg**	137	Mass transfer with complex chemical reaction in gas–liquid systems—II: Effect of unequal diffusivities on consecutive reactions

Number 2

J.A. Ramirez, A. Zinchenko, M. Loewenberg and **R.H. Davis**	149	The flotation rates of fine spherical particles under Brownian and convective motion
M.R. Mackley and **R.M.C. Neves Saraiva**	159	The quantitative description of fluid mixing using Lagrangian- and concentration-based numerical approaches
R. Krishna, M.I. Urseanu, J.M. van Baten and **J. Ellenberger**	171	Rise velocity of a swarm of large gas bubbles in liquids
R.K. Konduri, E.R. Altwicker and **M.H. Morgan III**	185	Design and scale-up of a spouted-bed combustor
A.A. Savoretti, D.O. Borio, V. Bucalá and **J.A. Porras**	205	Non-adiabatic radial-flow reactor for styrene production

D.E. Smiles 215 Centrifugal filtration of particulate systems

K.K. Tan and **R.B. Thorpe** 225 The onset of convection driven by buoyancy effects caused by various modes of transient heat conduction: Part I. Transient Rayleigh numbers

K.K. Tan and **R.B. Thorpe** 239 The onset of convection driven by buoyancy caused by various modes of transient heat conduction: Part II. The sizes of plumes

L.J.P. van den Broeke, W.J.W. Bakker, F. Kapteijn and **J.A. Moulijn** 245 Transport and separation properties of a silicalite-1 membrane—I. Operating conditions

L.J.P. van den Broeke, F. Kapteijn and **J.A. Moulijn** 259 Transport and separation properties of a silicalite-1 membrane—II. Variable separation factor

I.H. Huisman and **C. Trägårdh** 271 Particle transport in crossflow microfiltration—I. Effects of hydrodynamics and diffusion

I.H. Huisman, G. Trägårdh and **C. Trägårdh** 281 Particle transport in crossflow microfiltration—II. Effects of particle–particle interactions

Hui Liu and **Chenchen Qiu** 291 Letter to the Editor

Number 3

S.S Hsiau, J. Smid, C.Y. Wang, J.T. Kuo and **C.S. Chou** 293 Velocity profiles of granules in moving bed filters

M.J. Clifford 303 A Gaussian model for reaction and diffusion in a lamellar structure

H. Enwald, E. Peirano, A.E. Almstedt and **B. Leckner** 311 Simulation of the fluid dynamics of a bubbling fluidized bed. Experimental validation of the two-fluid model and evaluation of a parallel multiblock solver

H. Enwald and **A.E. Almstedt** 329 Fluid dynamics of a pressurized fluidized bed: comparison between numerical solutions from two-fluid models and experimental results

G. Baier, T.M. Grateful, M.D. Graham and **E.N. Lightfoot** 343 Prediction of mass transfer rates in spatially periodic flows

D. Yu, K. Jackson and **T.C. Harmon** 357 Dispersion and diffusion in porous media under supercritical conditions

W.R. Bowen, N. Hilal, M. Jain, R.W. Lovitt, A.O. Sharif and **C.J. Wright,** 369 The effects of electrostatic interactions on the rejection of colloids by membrane pores—visualisation and quantification

G. Xiu and **P. Li** 377 Linear chromatographic elution and breakthrough curves: quasi-lognormal distribution function and its derived equations

C. Lin, M. Zhou and **C.J. Xu** 389 Axisymmetrical two-dimensional heterogeneous mass transfer model for the absorption of gas into liquid–liquid dispersions

N. Epstein and **B.B. Pruden** 401 Liquid fluidisation of binary particle mixtures—III. Stratification by size and related topics

Number 4

S. Brandani, K. Austin and **D. Ruthven** 417 The flow pattern and residence time distribution for an endless belt solid–liquid contactor

Y.-T. Wu and **Z.-Q. Zhu** 433 Modeling of interfacial tension of aqueous two-phase systems

S. Illing and **S.T.L. Harrison** 441 The kinetics and mechanism of *Corynebacterium glutamicum* aggregate breakup in bioreactors

H.-Y. Xie and **K. Shinohara** 455 Measurement of solids velocity in a conical Hopper by mass tracer particles

A. Saboni, C. Gourdon and **A.K. Chesters** 461 The infuence of inter-phase mass transfer on the drainage of partially-mobile liquid films between drops undergoing a constant interaction force

D. Subramanian, J.A. Ritter and **Y. Liu** 475 Equilibrium theory for solvent vapor recovery by pressure swing adsorption: analytic solution with velocity variation and gas-phase capacity

M. Lindberg and **Å.C. Rasmuson** 483 Product concentration profile in strained reacting fluid films

G. Marbán, M. García-Calzada and **A.B. Fuertes** 495 Kinetics of oxidation of CaS particles in the regime of high SO_2 release

M. Stroescu, T. Dobre, O. Floarea 507 Differential liquid–solid extraction of sulphur from volcanic-type ore

V. Briones and **A.C. Kokossis** 519 Hypertargets: a Conceptual Programming approach for the optimisation of industrial heat exchanger networks—I. Grassroots design and network complexity

V. Briones and **A.C. Kokossis** 541 Hypertargets: a Conceptual Programming approach for the optimisation of industrial heat exchanger networks—II. Retrofit design

E.N. Lightfoot 563 Book Review

Number 5

F.B. Godin, D.G. Cooper and **A.D. Rey** 565 Development and solution of a cell mass population balance model applied to the SCF process

M. Amrhein, B. Srinivasan and **D. Bonvin** 579 Target factor analysis of reaction data: use of data pre-treatment and reaction-invariant relationships

K.C. Chen, R.M. Ford and **P.T. Cummings** 593 Spatial effect of tumbling frequencies for motile bacteria on cell balance equations

M.C. Kim, J.S. Baik, I.G. Hwang, D.-Y., Yoon and **C.K. Choi** 619 Buoyancy-driven convection in plane Poiseuille flow

Y. Li and **C.-W. Park** 633 A predictive model for the removal of colloidal particles in fibrous filter media

G.J.F. Smit and **J.P. du Plessis** 645 Modelling of non-Newtonian purely viscous flow through isotropic high porosity synthetic foams

L.L. Zhao and **G.T. Rochelle** 655 Mercury absorption in aqueous hypochlorite

S.-X. Cheng, T.-S. Chung and **S. Mullick** 663 Novel thin-film polymerization and time evolution of liquid crystal texture during polymerization

J.-J. Shieh, T.-S. Chung and **D.R. Paul** 675 Study on multi-layer composite hollow fiber membranes for gas separation

V. Briones and **A.C. Kokossis** 685 Hypertargets: a Conceptual Programming approach for the optimisation of industrial heat exchanger networks—Part III. Industrial applications

Shorter Communications

M. Wang and **J.J. Cilliers** 707 Detecting non-uniform foam density using electrical resistance tomography

G. Ma and **K.S. Chang** 713 Comments on "Convection–diffusion of solutes in media with piecewise constant transport properties" by Vaidya et al.

D.S. Vaidya, J.M. Nitsche, S.L. Diamond and **D.A. Kofke** 715 Reply to comments on "Convection–diffusion of solutes in media with piecewise constant transport properties"

Number 6

A. Jung and **P.J. Fryer** 717 Optimising the quality of safe food: Computational modelling of a continuous sterilisation process

C.L. Briens, M. Del Pozo, C. Trudell and **G. Wild** 731 Measurement and modeling of particle–liquid heat transfer in liquid–solid and gas–liquid–solid fluidized beds

N.P. Hankins and **F.G. Helfferich** 741 On the concept and application of 'partial coherence' in non-linear wave propagation

A. Beretta, P. Baiardi, D. Prina and **P. Forzatti** 765 Analysis of a catalytic annular reactor for very short contact times

K.K. Tan and **R.B. Thorpe** 775 On convection driven by surface tension caused by transient heat conduction

A. Attou, C. Boyer and **G. Ferschneider** 785 Modelling of the hydrodynamics of the cocurrent gas–liquid trickle flow through a trickle-bed reactor

M. Perez-Tello, H.Y. Sohn and **R.K. Rajamani** 803 The effect of bulk concentration gradient on fluid–solid reaction rate

M. Taghizadeh, C. Jallut, M. Tayakout-Fayolle and **J. Lieto** 807 Numerical simulation of non-isothermal gas–liquid absorption with chemical reaction on a spherical laminar film Application to phosgene absorption into aqueous sodium hydroxide solutions

P.H. Gaskell, H.M. Thompson, M.D. Savage and **J.B. Ikin** 819 Steady recirculating flow near static contact lines

S. Schmidt, J. Büchs, C. Born and **M. Biselli** 829 A new correlation for the wall-to-fluid mass transfer in liquid–solid fluidized beds

X. Ni, Y. Zhang and **I. Mustafa** 841 Correlation of polymer particle size with droplet size in suspension polymerisation of methylmethacrylate in a batch oscillatory-baffled reactor

Number 7

N. Mostoufi and **J. Chaouki** 851 Prediction of effective drag coefficient in fluidized beds

E. Jamshidi and **H. Ale Ebrahim** 859 A new solution technique for gas–solid reactions with structural changes

L.-D. Shiau, S.-H. Cheng and **Y.-C. Liu** 865 Modelling of a fluidized-bed crystallizer operated in a batch mode

S. Liu 873 Particle dispersion for suspension flow

C.R.A. Abreu, M. Castier and **F.W. Tavares** 893 A phase stability analysis of the combinatorial term of the UNIQUAC model

H.-M. Yeh and **Y.-S. Hsu** 897 Analysis of membrane extraction through rectangular mass exchangers

S.D. Taylor and **A.N. Hrymak** 909 Visualization and flow simulation of a two-layer slot coater

D.J. Lamberto, M.M. Alvarez and **F.J. Muzzio** 919 Experimental and computational investigation of the laminar flow structure in a stirred tank

S. Tessendorf, R. Gani and **M.L. Michelsen** 943 Modeling, simulation and optimization of membrane-based gas separation systems

Shorter Communications

B. Dai, Y. Fan, J. Yang and **J. Xiao** 957 Effect of radicals recombination on acetylene yield in process of coal pyrolysis by hydrogen plasma

C.Y. Wang 961 Maximum flow down a circular sector tube

Number 8

A.G.F. Stapley, K.A. Landman, C.P. Please and **P.J. Fryer**	965	Modelling the steaming of whole wheat grains
S.J. Weinstein and **K.J. Ruschak**	977	On the mathematical structure of thin film equations containing a critical point
P. Arora, R. Anand Kumar and **K.V. Venkatesh**	987	Analysis of the optimal model for substrate substitutability in continuous microbial cultures
A. Lawal and **D.M. Kalyon**	999	Analysis of nonisothermal screw extrusion processing of viscoplastic fluids with significant back flow
J.M.D. MacElroy, S.P. Friedman and **N.A. Seaton**	1015	On the origin of transport resistances within carbon molecular sieves
K.-D. Mohl, A. Kienle, E.-D. Gilles, P. Rapmund, K. Sundmacher and **U. Hoffmann**	1029	Steady-state multiplicities in reactive distillation columns for the production of fuel ethers MTBE and TAME: theoretical analysis and experimental verification
K.P. Galvin, S. Pratten and **G. Nguyen Tran Lam**	1045	A generalized empirical description for particle slip velocities in liquid fluidized beds
J.M. Zalc and **F.J. Muzzio**	1053	Parallel-competitive reactions in a two-dimensional chaotic flow
C.H. Newton, M. Behnia and **J.A. Reizes**	1071	The effect of liquid viscosity on gas wall and interfacial shear stress in horizontal two-phase pipe flow
J.M. van de Graaf, F. Kapteijn and **J.A. Moulijn**	1081	Permeation of weakly adsorbing components through a silicate-1 membrane
A.S. Khare and **K. Niranjan**	1093	An experimental investigation into the effect of impeller design on gas hold-up in a highly viscous Newtonian liquid
P. Andreussi, A. Paglianti and **F. Sanehez Silva**	1101	Dispersed bubble flow in horizontal pipes
E.-J. Shin and **M.A. Keane**	1109	Detoxification of dichlorophenols by catalytic hydrodechlorination using a nickel/silica catalyst
J.R.F. Guedes de Carvalho and **J.M.P.Q. Delgado**	1121	Mass transfer from a large sphere buried in a packed bed along which liquid flows
H. Haario, L. Kalachev, T. Salmi and **J. Lehtonen**	1131	Asymptotic analysis of chemical reactions
K.C. Leong, G.Q. Lu and **V. Rudolph**	1145	An upper bound solution for the coating thickness of cylinders in a fluidized bed

Shorter Communications

J. Li, Z. Zhang, W. Ge, Q. Sun and **J. Yuan**	1151	A simple variational criterion for turbulent flow in pipe
N.G. McDuffie	1155	Comments on "Carbonated water: The physics of the cycle of bubble production" by S.F. Jones, K.P. Galvin, G.M. Evans, and G.J. Jameson

K.P. Galvin 1157 Reply to Comments on "Carbonated water: The physics of the cycle of bubble production"

F. Takemura and **A. Yabe** 1159 Erratum

Number 9

M. Aoun, E. Plasari, R. David and **J. Villermaux** 1161 A simultaneous determination of nucleation and growth rates from batch spontaneous precipitation

S. Chakravarti and **W. Harmon Ray** 1181 Boundary identification and control of distributed parameter systems using singular functions

Q. Hu and **G.P. Rangaiah** 1205 Adaptive internal model control of nonlinear processes

R.D. Otterstedt, N.I. Jaeger, P.J. Plath and **J.L. Hudson** 1221 Global coupling effects on spatiotemporal patterns on a ring electrode

P. Buffière and **R. Moletta** 1233 Some hydrodynamic characteristics of inverse three phase fluidized-bed reactors

Z. Wang and **S. Wang** 1243 Instability of cast film and its relevane to membrane morphology

H.B. Eldredge and **D.C. Drown** 1253 Solids flow and mixing model for a fluidized bed coating and calcination process

M.J. Alfonso, A. Julbe, D. Farrusseng, M. Menéndez and **J. Santamaria** 1265 Oxidative dehydrogenation of propane on V/Al_2O_3 catalytic membranes. Effect of the type of membrane and reactant feed configuration

C. Gahn and **A. Mersmann** 1273 Brittle fracture in crystallization processes. Part A. Attrition and abrasion of brittle solids

C. Gahn and **A. Mersmann** 1283 Brittle fracture in crystallization processes. Part B. Growth of fragments and scale-up of suspension crystallizers

Shorter Communications

S.S. Bhagwat 1293 Simpler criteria for supersaturation in gas–liquid reactions

Number 10

SPECIAL ISSUE

1ST INTERNATIONAL SYMPOSIUM ON MULTIFUNCTIONAL REACTORS, AMSTERDAM, 25–28 APRIL 1999

1297 Preface

D.W. Agar 1299 Multifunctional reactors: Old preconceptions and new dimensions

W.-D. Xiao, H. Wang and **W.-K. Yuan** 1307 An SO_2 converter with flow reversal and interstage heat removal: From laboratory to industry

Session A: Reaction and Heat Exchange

D.O. Borio, N.S. Schbib and **J.E. Gatica** 1313 Reversal flow in fixed-bed reactors operating under reaction-regeneration cycles

I. Kobayashi, K. Yamamoto and **H. Kameyama** 1319 A proposal of a spray pulse operation for liquid film dehydrogenation – 2-propanol dehydrogenation on a plate catalyst

U. Friedle and **G. Veser** 1325 A counter-current heat-exchange reactor for high temperature partial oxidation reactions

W.-D. Xiao, H. Wang and **W.-K. Yuan** 1333 A novel unsteady-state SO_2 converter fore relatively concentrated SO_2 gases

Session B: Reaction and Distillation

J. Ellenberger and **R. Krishna** 1339 Counter-current operation of structured catalytically packed distillation colums: pressure drop, holdup and mixing

E. Kenig, K. Jakobsson, P. Banik, J. Aittamaa, A. Gorak, M. Koskinen and **P. Wettmann** 1347 An integrated tool for synthesis and design of reactive distillation

M. Hu, X.-G. Zhou and **W.-K. Yuan** 1353 Simulation and optimization of a coupled reactor/column system for trioxane synthesis

P.J.M. Lebens, F. Kapteijn, S.T. Sie and **J.A. Moulijn** 1359 Potentials and internally finned monoliths as a packing for multifunctional reactors

P. Moritz and **H. Hasse** 1367 Fluid dynamics in reactive distillation packing KATAPAK-S®

C. von Scala, M. Wehrli and **G. Gaiser** 1375 Heat transfer measurements and simulation of KATAPAK-M® catalyst supports

L.A. Serafimov, Y.A. Pisarenko and **N.N. Kulov** 1383 Coupling chemical reaction with distillation: Thermodynamic analysis and practical applications

A.P. Higler, R. Taylor and **R. Krishna** 1389 Non equilibrium modelling of reactive distillation: Multiple steady states in MTBE synthesis

Z. Xu and **M.P. Duduković** 1397 Modeling and simulation of semi-batch photo reactive distillation

B.W. van Hasselt, H.P.A. Calis, S.T. Sie and **C.M. van den Bleek** 1405 Liquid holdup in the three-levels-of-porosity reactor

O.L. Oudshoorn, M. Janissen, W.E.J. van Kooten, J.C. Jansen, H. van Bekkum, C.M. van den Bleek and **H.P. Calis** 1413 A novel structured catalyst packing for catalytic distillation of ETBE

H. Ben Amor and **V.L. Halloin** 1419 Methanol synthesis in a multifunctional reactor

S.M. Mahajani 1425 Design of reactive distillation columns for multicomponent kinetically controlled reactive systems

Session C: Reaction and Membrane Separation

R. Dittmeyer, V. Höllein, P. Quicker, G. Emig, G. Hausinger and **F. Schmidt** 1431 Factors controlling the performance of catalytic dehydrogenation of ethylbenzene in palladium composite membrane reactors

J.M. van de Graaf, M. Zwiep, F. Kapteijn and **J.A. Moulijn** 1441 Application of a zeolite membrane reactor in the metathesis of propene

O. Schramm and **A. Seidel-Morgenstern** 1447 Comparing porous and dense membranes for the application in membrane reactors

K. Jarosch and **H.I. de Lasa** 1455 Novel riser simulator for methane reforming using high temperature membranes

L. Domingues, F. Recasens and **M.A. Larrayoz** 1461 Studies of a pervaporation reactor: Kinetics and equilibrium shift in benzyl alcohol acetylation

G. Langhendries, G.V. Baron and **P.A. Jacobs** 1467 Selective and efficient hydrocarbon oxidation in a packed bed membrane reactor

V. Cauwenberg, P. Vergossen, A. Stankiewicz and **H. Kierkels** 1473 Integration of reaction and separation in manufacturing of pharmaceuticals: Membrane-mediate production of S-Ibuproferr

Session D: Reaction and Sorption Operations

T. Falk and **A. Seidel-Morgenstern** 1479 Comparison between a fixed-bed reactor and a chromatographic reactor

J. Fricke, M. Meurer, J. Dreisörner and **H. Schmidt-Traub** 1487 Effect of process parameters on the performance of a simulated moving bed chromatographic reactor

F. Štěpánek, M. Kubíček, M.A. Marek and **P.M. Adler** 1493 Optimal design and operation of a separating microreactor

E. Santacesaria, M. Di Serio and **P. Iengo** 1499 Mass transfer and kinetics in ethoxylation spray tower loop reactors

Y. Matatov-Meytal, O. Nekhamkina and **M. Sheintuch** 1505 Modeling and optimization of a periodic process of adsorption and catalytic regeneration

Z.L. Arsenijevic, B.V. Grbic, Z.B. Grbavcic, N.D. Radic and **A.V. Terlecki-Baricevic** 1519 Ethylene oxide removal in combined sorbent/catalyst system

E. Obuchi, T. Sakamoto, K. Nakano and **F. Shiraishi** 1525 Photocatalytic decomposition of acetaldehyde over TiO_2/SiO_2 catalyst

Z. Bingchen, W. Yuanshun and **W. Hongshi** 1531 Modelling catalytic reaction–absorption coupling process of ethylene oxide synthesis in slurry reactor

Session E: Multifunctional Reactors for Sustainable Industry and Clean Environment

T. Ishihara, T. Yamada, T. Akbay and **Y. Takita** 1535 Partial oxidation of methane over fuel cell type reactor for simultaneous generation of synthesis gas and electric power

G.J. Harmsen and **L.A. Chewter** 1541 Industrial applications of multi-functional, multi-phase reactors

F. Shiraishi, K. Toyoda, S. Fukinbara, E. Obuchi and **K. Nakano** 1547 Photolytic and photocatalytic treatment of an aqueous solution containing microbial cells and organic compounds in an annular-flow reactor

T. Tagawa, K.K. Moe, M. Ito and **S. Goto** 1553 Fuel cell type reactor for chemicals-energy co-generation

T. Dobre, A. Guzun-Stoica and **O. Floarea** 1559 Reactive extraction of phenols using sulfuric acid salts of trioctylamine

V.D. Mesheryakov, V.A. Kirillov and **N.A. Kuzin** 1565 A multifunctional reactor with a regular catalyst packing for Fischer-Tropsch synthesis

Y.X. Li, M. Cheng, L.H. Liu and **W.-K. Yuan** 1571 Catalytic oxidation of dilute SO_2 over activated carbon coupled with partial liquid phase vaporization

K. Daun, G. Emig, M.-J. Chollier, M. Cullant and **R. Dittmeyer** 1577 Studies on the use of catalytic membranes for reduction of nitrate in drinking water

J.-P. Mikkola and **T. Salmi** 1583 In-situ ultrasonic catalyst rejuvenation in three-phase hydorgenation of xylose

E.L.V. Goetheer, M.A.G. Vorstman and **J.T.F. Keurentjes** 1589 Opportunities for process intensification using reverse micelles in liquid and supercritical carbon dioxide

I Index

Number 11

K. Wintermantel 1597 Thirteenth P.V. Danckwerts Memorial Lecture. Process and product engineering – achievements, present and future challenges

V. Balakotaiah and **S.M.S. Dommeti** 1621 Effective models for packed-bed catalytic reactors

S. Wang and **H. Hofmann** 1639 Strategies and methods for the investigation of chemical reaction kinetics

P. Castro, H. Matos, M.C. Fernandes and **C.P. Nunes** 1649 Improvements for mass-exchange networks design

V. Pérez-Herranz, J.L. Guiñón and **J. García-Antón** 1667 Analysis of mass and momentum transfer in an annular electrodialysis cell in pulsed flow

F. James, M. Sepúlveda, F. Charton, I. Quiñones and **G. Guiochon** 1677 Determination of binary competitive equilibrium isotherms from the individual chromatographic band profiles

N. Kazantzis and **C. Kravaris** 1697 Energy-predictive control: a new synthesis approach for nonlinear process control

F.C. Rubio, J.L. Garcia, E. Molina and **Y. Chisti** 1711 Steady-state axial profiles of dissolved oxygen in tall bubble column bioreactors

V. Balakotaiah, E.L. Christoforatou and **D.H. West** 1725 Transverse concentration and temperature nonuniformities in adiabatic packed-bed catalytic reactors

C.I.C. Pinheiro, F. Lemos and **F.R. Ribeiro** 1735 Dynamic modelling and network simulation of n-heptane catalytic cracking: influence of kinetic parameters

Number 12

R. Krishna, T.J.H. Vlugt and **B. Smit** 1751 Influence of isotherm inflection on diffusion in silicalite

X. Zhang 1759 Dynamics of drop formation in viscous flows

R. Khodayari and **C.U. Ingemar Odenbrand** 1775 Selective catalytic reduction of NO_x: a mathematical model for poison accumulation and conversion performance

K. Thomsen and **P. Rasmussen** 1787 Modeling of vapor–liquid–solid equilibrium in gas–aqueous electrolyte systems

T.-W. Chung and **C.-C. Chung** 1803 Increase in the amount of adsorption on modified activated carbon by using neutron flux irradiation

M.Y. Louge, V. Bricout and **S. Martin-Letellier** 1811 On the dynamics of pressurized and atmospheric circulating fluidized bed risers

A.L. Paiva, D. van Rossum and **F.X. Malcata** 1825 Integrated vs. sequential reaction and separation: contributions for a global analysis

G. Xu and **K. Kato** 1837 Hydrodynamic equivalent diameter for clusters in heterogeneous gas–solid flow

J.M. Herri, F. Gruy, J.S. Pic, M. Cournil, B. Cingotti and **A. Sinquin** 1849 Interest of in situ turbidimetry for the characterization of methane hydrate crystallization: Application to the study of kinetic inhibitors

X. Wang, F. Thauvin and **K.K. Mohanty** 1859 Non-Darcy flow through anisotropic porous media

F.I. Talens-Alesson 1871 The modelling of falling film chemical reactors

M.A. Al-Nimr and **M.A. Hader** 1883 MHD free convention flow in open-ended vertical porous channels

M.A. El-Rifai and **R.S. Ettouney** 1891 Integrated analysis of coupled separation operations

A. Geist, W. Nitsch and **Jae-Il Kim** 1903 On the kinetics of rare-earth extraction into D2EHPA

W.A.J. van Benthum, J.H.A. van den Hoogen, R.G.J.M. van der Lans, M.C.M. van Loosdrecht and **J.J. Heijnen** 1909 The biofilm airlift suspension extension reactor. Part I: Design and two-phase hydrodynamics

1925 Errata

Numbers 13–14

SPECIAL ISSUE

ISCRE 15

CHEMICAL REACTION ENGINEERING FOR THE 21ST CENTURY NEWPORT BEACH, CALIFORNIA

PART A

1927 Preface

Plenaries

D.A. Dixon and **D. Feller** 1929 Computational chemistry and process design

H. Komiyama, Y. Shimogaki and **Y. Egashira** 1941 Chemical reaction engineering in the design of CVD reactors

C.J. Pereira 1959 Environmentally friendly processes

M.P. Dudukovic, F. Larachi and **P.L. Mills** 1975 Multiphase reactors – revisited

G. Saracco, H.W.J.P. Neomagus, G.F. Versteeg and **W.P.M. van Swaaij** 1997 High-temperature membrane reactors: potential and problems

GROUP I

Fluidized bed reactors

Y. Cheng, Y. Guo, F. Wei, Y. Jin and **W. Lin** 2019 Modeling the hydrodynamics of downer reactors based on kinetic theory

R. Sotudeh-Gharebaagh, J. Chaouki and **R. Legros** 2029 Natural gas combustion in a turbulent fluidized bed of inert particles

J. Chaouki, A. Gonzalez, C. Guy and **D. Klvana** 2039 Two-phase model for a catalytic turbulent fluidized-bed reactor: Application to ethylene synthesis

R.F. Mudde, W.K. Harteveld, H.E.A. van den Akker, T.H.J.J. van der Hagen and **H. van Dam** 2047 Gamma radiation densitometry for studying the dynamics of fluidized beds

A.J. Hoekstra, J.J. Derksen and **H.E.A. Van Den Akker** 2055 An experimental and numerical study of turbulent swirling flow in gas cyclones

S. Huang, Z. Wang and **Y. Jin** 2067 Studies on gas–solid–solid circulating fluidized-bed reactors

J. Ouyang and **J. Li** 2077 Particle-motion-resolved discrete model for simulating gas–solid fluidization

K.-J. Marschall and **L. Mleczko** 2085 CFD modeling of an internally circulating fluidized-bed reactor

S. Roy, B.B. Pruden, A.M. Adris, J.R. Grace and **C.J. Lim** 2095 Fluidized-bed steam methane reforming with oxygen input

J.C. Schouten, R.C. Zijerveld and **C.M. van den Bleek**	2103	Scale-up of bottom-bed dynamics and axial solids-distribution in circulating fluidized beds of Geldart-B particles
D. Tayebi, H.F. Svendsen, A. Grislingås, T. Mejdell and **K. Johannessen**	2113	Dynamics of fluidized-bed reactors. Development and application of a new multi-fiber optical probe
J.A. Talman, R. Geier and **L. Reh**	2123	Development of a downer reactor for fluid catalytic cracking
M. Mortensen, R.G. Minet, T.T. Tsotsis and **S.W. Benson**	2131	The development of a dual fluidized-bed reactor system for the conversion of hydrogen chloride to chlorine
B.G.M. van Wachem, J.C. Schouten, R. Krishna and **C.M. van den Bleek**	2141	Validation of the Eulerian simulated dynamic behaviour of gas–solid fluidised beds
T. Knoebig, K. Luecke and **J. Werther**	2151	Mixing and reaction in the circulating fluidized bed – A three-dimensional combustor model
P.M. Johnston, H.I. de Lasa and **J.-X. Zhu**	2161	Axial flow structure in the entrance region of a downer fluidized bed: Effects of the distributor design
M.L. Thompson, H. Bi and **J.R. Grace**	2175	A generalized bubbling/turbulent fluidized-bed reactor model

Bubble column reactors

J. Chen, F. Li, S. Degaleesan, P. Gupta, M.H. Al-Dahhan, M.P. Duduković and **B.A. Toseland**	2187	Fluid dynamic parameters in bubble columns with internals
J. Chen, A. Kemoun, M.H. Al-Dahhan, M.P. Duduković, D.J. Lee and **L.-S. Fan**	2199	Comparative hydrodynamics study in bubble column using computer-automated radioactive particle tracking (CARPT)/computed tomography (CT) and particle image velocimetry (PIV)
J. Lea and **A.A. Adesina**	2209	Continuous flow bubble column reactor for the photocatalytic causticisation of sodium oxalate
E. Delnoij, J.A.M. Kuipers and **W.P.M. van Swaaij**	2217	A three-dimensional CFD model for gas–liquid bubble columns
D.J. Lee, X. Luo and **L.-S. Fan**	2227	Gas disengagement technique in a slurry bubble column operated in the coalesced bubble regime
H.M. Letzel, J.C. Schouten, R. Krishna and **C.M. van den Bleek**	2237	Gas holdup and mass transfer in bubble column reactors operated at elevated pressure
H.Z. Li	2247	Bubbles in non-Newtonian fluids: Formation, interactions and coalescence
J. Korpijarvi, P. Oinas and **J. Reunanen**	2255	Hydrodynamics and mass transfer in an airlift reactor
M.A. Márquez, R.J. Amend, R.G. Carbonell, A.E. Sáez and **G.W. Roberts**	2263	Hydrodynamics of gas-lift reactors with a fast, liquid-phase reaction
A. Sokolichin and **G. Eigenberger**	2273	Applicability of the standard k–ε turbulence model to the dynamic simulation of bubble columns: Part I. Detailed numerical simulations

Stirred multiphase reactors

A.K. Sahu, P. Kumar, A.W. Patwardhan and **J.B. Joshi** 2285 CFD modelling and mixing in stirred tanks

J. Khinast, D. Luss, T.M. Leib and **M.P. Harold** 2295 Impact of an undesired reaction on a boiling slurry reactor

V.V. Ranade and **V.R. Deshpande** 2305 Gas–liquid flow in stirred reactors: Trailing vortices and gas accumulation behind impeller blades

C. Roizard, S. Poncin, F. Lapicque, X. Py and **N. Midoux** 2317 Behavior of fine particles in the vicinity of a gas bubble in a stagnant and a moving fluid

D.W.F. Brilman, R. Antink, W.P.M. van Swaaij and **G.F. Versteeg** 2325 Experimental study of the effect of bubbles, drops and particles on the product distribution for a mixing sensitive, parallel-consecutive reaction system

Multiphase reactors

A.A. Barresi, D. Marchisio and **G. Baldi** 2339 On the role of micro- and mesomixing in a continuous Couette-type precipitator

A. Cybulski, A. Stankiewicz, R.K. Edvinsson Albers and **J.A. Moulijn** 2351 Monolithic reactors for fine chemicals industries: A comparative analysis of a monolithic reactor and a mechanically agitated slurry reactor

E. García-Calvo, A. Rodríguez, A. Prados and **J. Klein** 2359 A fluid dynamic model for three-phase airlift reactors

P.T. Ketikidis, C.G. Spourtoudi, G.J. Tjatjopoulos and **I.A. Vasalos** 2371 Cold flow studies and computer simulation of a slurry transport reactor for the alkylation of isobutane using zeolite-based catalysts

P.J.M. Lebens, M.M. Stork, F. Kapteijn, S.T. Sie and **J.A. Moulijn** 2381 Hydrodynamics and mass transfer issues in a countercurrent gas-liquid internally finned monolith reactor

C. Julcour, F. Stüber, J.M. Le Lann, A.M. Wilhelm and **H. Delmas** 2391 Dynamics of a three-phase upflow fixed-bed catalytic reactor

J. Zahradník, G. Kuncová and **M. Fialová** 2401 The effect of surface active additives on bubble coalescence and gas holdup in viscous aerated batches

Y. Jiang, M.R. Khadilkar, M.H. Al-Dahhan and **M.P. Dudukovic** 2409 Two-phase flow distribution in 2D trickle-bed reactors

M.R. Khadilkar, P.L. Mills and **M.P. Dudukovic** 2421 Trickle-bed reactor models for systems with a volatile liquid phase

GROUP II

Reactor modelling and simulation

S.A. Logtenberg, M. Nijemeisland and **A.G. Dixon** 2433 Computational fluid dynamics simulations of fluid flow and heat transfer at the wall–particle contact points in a fixed-bed reactor

J.-M. Schweitzer, P. Galtier and **D. Schweich** 2441 A single events kinetic model for the hydrocracking of paraffins in a three-phase reactor

K.L. Levien and **O. Levenspiel**	2453	Optimal product distribution from laminar flow reactors: Newtonian and other power-law fluids
T. Mejdell, T. Pettersen, C. Naustdal and **H.F. Svendsen**	2459	Modelling of industrial S-PVC reactor
E. Molga and **R. Cherbański**	2467	Hybrid first-principle–neural-network approach to modelling of the liquid–liquid reacting system
C. Migliorini, M. Fillinger, M. Mazzotti and **M. Morbidelli**	2475	Analysis of simulated moving-bed reactors
Y. Pan, M.P. Dudukovic and **M. Chang**	2481	Dynamic simulation of bubbly flow in bubble columns
J.E. Visser, P.F. Rozendal, H.W. Hoogstraten and **A.A.C.M. Beenackers**	2491	Three-dimensional numerical simulation of flow and heat transfer in the Sulzer SMX static mixer
J.H.G. van der Stegen, A.J. van der Veen, H. Weerdenburg, J.A. Hogendoorn and **G.F. Versteeg**	2501	Application of the Maxwell–Stefan theory to the transport in ion-selective membranes used in the chloralkali electrolysis process
H.-J. Warnecke, M. Schäfer, J. Prüss and **M. Weidenbach**	2513	A concept of simulate an industrial size tube reactor with fast complex kinetics and absorption of two gases on the basis of CFD modeling
H. Qi, X.-G. Zhou, L.-H. Liu and **W.-K. Yuan**	2521	A hybrid neural network-first principles model for fixed-bed reactor
G.W. Koning and **K.R. Westerterp**	2527	Modeling of heat transfer in wall-cooled tubular reactors
M. Feinberg	2535	Recent results in optimal reactor synthesis via attainable region theory

Dynamics of chemical reactors

M. Cassanello, F. Larachi, R. Legros and **J. Chaouki**	2545	Solids dynamics from experimental trajectory time-series of a single particle motion in gas-spouted beds
P. Ciambelli, A. Di Benedetto, R. Pirone and **G. Russo**	2555	Mathematical modelling of self-sustained isothermal oscillations in N_2O decomposition on Cu-ZSM5
D.A. Stradiotto, R.R. Hudgins and **P.L. Silveston**	2561	Hydrogenation of crotonaldehyde under periodic flow interruption in a trickle bed
R. Lange, R. Gutsche and **J. Hanika**	2569	Forced periodic operation of a trickle-bed reactor
K. Opoku-Gyamfi and **A.A. Adesina**	2575	Forced composition cycling of a novel thermally self-sustaining fluidised-bed reactor for methane reforming
M.R. Khadilkar, M.H. Al-Dahhan and **M.P. Dudukovic**	2585	Parametric study of unsteady-state flow modulation in trickle-bed reactors
M. Mangold, A. Kienle, E.-D. Gilles, M. Richter and **E. Roschka**	2597	Coupled reaction zones in a circulation loop reactor
J. Jirát, F. Štěpánek, M. Kubiček and **M. Marek**	2609	Nonstationary operation of a system of catalytic monolithic reactors for selective NO_x reduction

U. Nieken and **O. Watzenberger** 2619 Periodic operation of the Deacon process

A.S. Cote, W.N. Delgass and **D. Ramkrishna** 2627 Investigation of spatially patterned catalytic reactors

G. Kolios and **G. Eigenberger** 2637 Styrene synthesis in a reverse-flow reactor

I. Yongsunthon and **E. Alpay** 2647 Design of periodic adsorptive reactors for the optimal integration of reaction, separation and heat exchange

S.C. Korre, J.T. Wyatt, D.C. Dankworth and **R.M. Koros** 2659 A simplified model for management of resonance exotherms in fixed-bed reactors using liquid carriers

Process control

A. Kalani and **P.D. Christofides** 2669 Nonlinear control of spatially inhomogenous aerosol processes

F.J. Doyle III and **F. Kayihan** 2679 Reaction profile control of the continuous pulp digester

M. Lombardi, K. Fiaty and **P. Laurent** 2689 Implementation of observer for on-line estimation of concentration in continuous-stirred membrane bioreactor: Application to the fermentation of lactose

H.M. Kvamsdal, H.F. Svendsen, T. Hertzberg and **O. Olsvik** 2697 Dynamic simulation and optimization of a catalytic steam reformer

F. Fournier, M.A. Latifi and **G. Valentin** 2707 Methodology of dynamic optimization and optimal control of batch electrochemical reactors

M. Fikar, M.A. Latifi and **Y. Creff** 2715 Optimal changeover profiles for an industrial depropanizer

S.R. Ismail, E.N. Pistikopoulos and **K.P. Papalexandri** 2721 Synthesis of reactive and combined reactor/separation systems utilizing a mass/heat exchange transfer module

Y.C. Huang and **X.Z. Wang** 2731 Application of fuzzy causal networks to waste water treatment plants

X.-G. Zhou, L.-H. Liu and **W.-K. Yuan** 2739 Optimizing control of a wall-cooled fixed-bed reactor

J.A.D. Rodrigues and **R.M. Filho** 2745 Production optimization with operating constraints for a fed-batch reactor with DMC predictive control

GROUP III

Advances in industrial processes

G. Christensen, M.R. Apelian, K.J. Hickey and **S.B. Jaffe** 2753 Future directions in modeling the FCC process: An emphasis on product quality

C.J. Tijsen, H.J. Scherpenkate, E.J. Stamhuis and **A.A.C.M. Beenackers** 2765 Optimisation of the process conditions for the modification of starch

T. Masuda, H. Kuwahara, S.R. Mukai and **K. Hashimoto** 2773 Production of high quality gasoline from waste polyethylene derived heavy oil over Ni-REY catalyst in steam atmosphere

A.M. Thanos, P.A. Galtier and **N.G. Papayannakos** 2781 The effect of dilution on the liquid-phase non-idealities in pilot scale upflow reactors

X.D. Peng, B.A. Toseland and **P.J.A. Tijm** 2787 Kinetic understanding of the chemical synergy under LPDME™ conditions—once-through applications

J. Lehtonen, J. Kaplin, T. Salmi, H. Haario, A. Vuori and **E. Tirronen** 2793 Modelling and scale-up of a loop reactor for hydrogenation processes

E. Santacesaria, M. Di Serio, A. Russo, U. Leone and **R. Velotti** 2799 Kinetic and catalytic aspects in the hydrogen peroxide production via anthraquinone

Novel reactors and processes

D. Casanave, P. Ciavarella, K. Fiaty and **J.-A. Dalmon** 2807 Zeolite membrane reactor for isobutane dehydrogenation: Experimental results and theoretical modelling

R.J. Brandi, O.M. Alfano and **A.E. Cassano** 2817 Rigorous model and experimental verification of the radiation field in a flat-plate solar collector simulator employed for photocatalytic reactions

O. Dahlem, J. Reisse and **V. Halloin** 2829 The radially vibrating horn: A scaling-up possibility for sonochemical reactions

K. Sundmacher, G. Uhde and **U. Hoffmann** 2839 Multiple reactions in catalytic distillation processes for the production of the fuel oxygenates MTBE and TAME: Analysis by rigorous model and experimental validation

C. Horst, U. Kunz, A. Rosenplänter and **U. Hoffmann** 2849 Activated solid–fluid reactions in ultrasound reactors

Y. Ikushima, Z. Shervani, N. Saito, K. Hatakeda, O. Sato, T. Aizawa and **M. Arai** 2859 Acceleration of chemical reaction by AOT micelles under supercritical conditions

S.W. Dähnke and **F.J. Keil** 2865 Modeling of linear pressure fields in sonochemical reactors considering an inhomogeneous density distribution of cavitation bubbles

A.P. Higler, R. Taylor and **R. Krishna** 2873 The influence of mass transfer and mixing on the performance of a tray column for reactive distillation

C.I. Liu and **D.J. Lee** 2883 Micromixing effects in a couette flow reactor

Yu.Sh. Matros, G.A. Bunimovich, V.O. Strots and **E.A. Mirosh** 2889 Reversed flow converter for emission control after automotive engines

A. Meier 2899 A predictive CFD model for a falling particle receiver/reactor exposed to concentrated sunlight

B. Bosio, P. Costamagna and **F. Parodi** 2907 Modeling and experimentation of molten carbonate fuel cell reactors in a scale-up process

C. Téllez, M. Menéndez and **J. Santamaría** 2917 Simulation of an inert membrane reactor for the oxidative dehydrogenation of butane

K. Sundmacher and **K. Scott** 2927 Direct methanol polymer electrolyte fuel cell: Analysis of charge and mass transfer in the vapour–liquid–solid system

K. Sundmacher and **U. Hoffmann**	2937	Design and operation of a membrane reactor for electrochemical gas purification
A.Y. Tonkovich, J.L. Zilka, M.J. LaMont, Y. Wang and **R.S. Wegeng**	2947	Microchannel reactors for fuel processing applications. I. Water gas shift reactor
H. Monnier, A.M. Wilhelm and **H. Delmas**	2953	The influence of ultrasound on micromixing in a semi-batch reactor
S. Wroński, E. Dłuska, R. Hubacz and **E. Molga**	2963	Mass transfer in gas–liquid Couette–Taylor flow in membrane reactor
X.-S. Zhang, G.-B. Wu, P. Ding, X.-G. Zhou and **W.-K. Yuan**	2969	Studies on paired packed-bed electrode reactor: Modeling and experiments
D. Chmielewski, Z. Ziaka and **V. Manousiouthakis**	2979	Conversion targets for plug flow membrane reactors
H.J. Viljoen and **V. Hlavacek**	2985	Solid–solid reaction with mechanical coupling

Numbers 15–16

SPECIAL ISSUE

ISCRE 15

CHEMICAL REACTION ENGINEERING FOR THE 21ST CENTURY
NEWPORT BEACH, CALIFORNIA

PART B

Environmental – Air pollution

J.F. Akyurtlu and **A. Akyurtlu**	2991	Behavior of ceria-copper oxide sorbents under sulfation conditions
K. Karan, A.K. Mehrotra and **L.A. Behie**	2999	A high-temperature experimental and modeling study of homogeneous gas-phase COS reactions applied to Claus plants
Y. Zeng, S. Zhang, F.R. Groves and **D.P. Harrison**	3007	High temperature gas desulfurization with elemental sulfur production
A. Lancia, D. Musmarra, M. Prisciandaro and **M. Tammaro**	3019	Catalytic oxidation of calcium bisulfite in the wet limestone–gypsum flue gas desulfurization process
M. Moazzem Hossain and **G.B. Raupp**	3027	Polychromatic radiation field model for a honeycomb monolith photocatalytic reactor
G. Saracco, C. Badini and **V. Specchia**	3035	Catalytic traps for diesel particulate control

Environmental – liquid and solid processes

H. Bockhorn, J. Hentschel, A. Hornung and **U. Hornung**	3043	Environmental engineering: stepwise pyrolysis of plastic waste
R. Orrù, M. Sannia, A. Cincotti and **G. Cao**	3053	Treatment and recycling of zinc hydrometallurgical wastes by self-propagating reactions

B. Serrano and **H. de Lasa** 3063 Photocatalytic degradation of water organic pollutants: pollutant reactivity and kinetic modeling

L. Mukadi, C. Guy and **R. Legros** 3071 Parameter analysis and scale-up considerations for thermal treatment of industrial waste in an internally circulating fluidized bed reactor

K. Hatakeda, Y. Ikushima, O. Sato, T. Aizawa and **N. Saito** 3079 Supercritical water oxidation of polychlorinated biphenyls using hydrogen peroxide

L.J. Graham and **G. Jovanovic** 3085 Dechlorination of *p*-chlorophenol on a Pd/Fe catalyst in a magnetically stabilized fluidized bed; implications for sludge and liquid remediation

D.R. Grymonpré, W.C. Finney and **B.R. Locke** 3095 Aqueous-phase pulsed streamer corona reactor using suspended activated carbon particles for phenol oxidation: model-data comparison

I. Mazzarino and **P. Piccinini** 3107 Photocatalytic oxidation of organic acids in aqueous media by a supported catalyst

A.K. Ray 3113 Design, modelling and experimentation of a new large-scale photocatalytic reactor for water treatment

Biochemical processing

F.J. Montes, M.A. Galan and **R.L. Cerro** 3127 Mass transfer from oscillating bubbles in bioreactors

A.J.G. Cruz, A.S. Silva, M.L.G.C. Araujo, R.C. Giordano and **C.O. Hokka** 3137 Modelling and optimization of the cephalosporin C production bioprocess in a fed-batch bioreactor with invert sugar as substrate

C. Nicolella, M.C.M. van Loosdrecht and **J.J. Heijnen** 3143 Identification of mass transfer parameters in three-phase biofilm reactors

G.L. Rorrer and **R.K. Mullikin** 3153 Modeling and simulation of a tubular recycle photobioreactor for macroalgal cell suspension cultures

F. Bosco, B. Ruggeri and **G. Sassi** 3163 Performances of a trickle-bed reactor (TBR) for exoenzymes production by Phanerochaete chrysosporium: influence of superfacial liquid velocity

M.S. Levy, L.A.S. Ciccolini, S.S.S. Yim, J.T. Tsai, N. Titchener-Hooker, P. Ayazi Shamlou and **P. Dunnill** 3171 The effects of material properties and fluid flow intensity on plasmid DNA recovery during cell lysis

M. Kino-Oka, Y. Hitaka, M. Taya and **S. Tone** 3179 High-density culture of red beet hairy roots by considering medium flow condition in bioreactor

B.C.E. Schwarz, J.S. Devinny and **T.T. Tsotsis** 3187 Degradation of PCE in an anaerobic waste gas by biofiltration

J.G. Ochoa, S. Foucher, S. Poncin, D. Morin and **G. Wild** 3197 Bioleaching of mineral ores in a suspended solid bubble column: hydrodynamics, mass transfer and reaction aspects

J.L. den Hollander, Y.W. Wong, K.Ch.A.M. Luyben and **L.A.M. van der Wielen** 3207 Non-separating effects in a centrifugal partition chromatographic reactor for the enzymatic production of L-amino acids

F. Cioci, R. Lavecchia and **P. Mazzocchi** 3217 An enzymatic membrane reactor for extracorporeal blood oxygenation

Polymerization reactions and reactors

A. Butté, G. Storti and **M. Morbidelli** 3225 Kinetics of "living" free radical polymerization

N.H. Kolhapure and **R.O. Fox** 3233 CFD analysis of micromixing effects on polymerization in tubular low-density polyethylene reactors

R. Giudici, C.A.O. Nascimento, A. Tresmondi A. Domingues and **R. Pellicciotta** 3243 Mathematical modeling of an industrial process of nylon-6,6 polymerization in a two-phase flow tubular reactor

N. Lazaridis, A.H. Alexopoulos, E.G. Chatzi and **C. Kiparissides** 3251 Steric stabilization in emulsion polymerization using oligomeric nonionic surfactants

A. Prasetya, L. Liu, J. Litster, F. Watanabe, K. Mitsutani and **G.H. Ko** 3263 Dynamic model development for residence time distribution control in high-impact polypropylene copolymer process

G. Maschio, I. Ferrara, C. Bassani and **H. Nieman** 3273 An integrated calorimetric approach for the scale-up of polymerization reactors

F.H.A.M. van den Boomen, J. Meuldijk and **D. Thoenes** 3283 Emulsion copolymerisation in a flexible continuously operated reactor

G. Weickert, G.B. Meier, J.T.M. Pater and **K.R. Westerterp** 3291 The particle as microreactor: catalytic propylene polymerizations with supported metallocenes and Ziegler–Natta catalysts

Materials processing

N. Asli Sezgi, T. Dogu and **H. Onder Ozbelge** 3297 Mechanism of CVD of boron by hydrogen reduction of BCl_3 in a dual impinging-jet reactor

A. Armaou and **P.D. Christofides** 3305 Plasma enhanced chemical vapor deposition: modeling and control

M.H.J.M. de Croon, E.N. Orij and **G.B. Marin** 3315 The kinetics of the low-pressure chemical vapour deposition of molybdenum on silicon from molybdenum hexafluoride and hydrogen

M. Kawase, T. Tago, M. Kurosawa, H. Utsumi and **K. Hashimoto** 3327 Chemical vapor infiltration and deposition to produce a silicon carbide–carbon functionally gradient material

T. Hanabusa, S. Uemiya and **T. Kojima** 3335 Production of Si_3N_4/Si_3N_4 and Si_3N_4/Al_2O_3 composites by CVD coating of fine particles with ultrafine powder

A. Meier, V.A. Kirillov, G.G. Kuvshinov, Yu.I. Mogilnykh, A. Reller, A. Steinfeld and **A. Weidenkaff** 3341 Solar thermal decomposition of hydrocarbons and carbon monoxide for the production of catalytic filamentous carbon

R. Orru, G. Cao and **Z.A. Munir** 3349 Mechanistic investigation of the field-activated combustion synthesis (FACS) of titanium aluminides

A.S. Mukasyan, A.S. Rogachev and **A. Varma** 3357 Mechanisms of reaction wave propagation during combustion synthesis of advanced materials

R.S. Souleimanova, A.S. Mukasyan and **A. Varma** 3369 Study of structure formation during electroless plating of thin metal-composite membranes

Molecular modeling of complex reactions

D.J. Klinke II and **L.J. Broadbelt** 3379 Construction of mechanistic model of Fischer–Tropsch synthesis on Ni(1 1 1) and Co(0 0 0 1) surfaces

L. Hagey and **H. de Lasa** 3391 C_1–C_4 Hydrocarbons from synthesis gas Reaction network modelling

D.J. Dooling, R.J. Nielsen and **L.J. Broadbelt** 3399 A density-functional study of the interaction of nitrogen with ruthenium clusters

E.W. Hansen and **M. Neurock** 3411 Modeling surface kinetics with first-principles-based molecular simulation

V. Pallassana and **M. Neurock** 3423 Theoretical density functional study of the hydrogenation of maleic acid over Pd and Re surfaces

A. Violi, A. D'Anna and **A. D'Alessio** 3433 Modeling of particulate formation in combustion and pyrolysis

Catalyst preparation and physical property

R. Agnihotri, S.S. Chauk, S.K. Mahuli and **L.-S. Fan** 3443 Mechanism of CaO reaction with H_2S: Diffusion through CaS product layer

M.-O. Coppens, A.T. Bell and **A.K. Chakraborty** 3455 Dynamic Monte-Carlo and mean-field study of the effect of strong adsorption sites on self-diffusion in zeolites

D. Chen, H.P. Rebo and **A. Holmen** 3465 Diffusion and deactivation during methanol conversion over SAPO-34: a percolation approach

U.A. El-Nafaty and **R. Mann** 3475 Support-pore architecture optimization in FCC catalyst particles using designed pore networks

C. Rieckmann and **F.J. Keil** 3485 Simulation and experiment of multicomponent diffusion and reaction in three-dimensional networks

A. Galík, A. Galíková and **K. Klusáček** 3495 Gravimetric transient response study of adsorption and reaction of propylamines on alumina

S.P. Rigby and **L.F. Gladden** 3503 The prediction of transport properties of porous media using fractal models and NMR experimental techniques

J. Šefčík and **A.V. McCormick** 3513 Prediction of crystallization diagrams for synthesis of zeolites

G. Xomeritakis, A. Gouzinis, S. Nair, T. Okubo, M. He, R.M. Overney and **M. Tsapatsis** 3521 Growth, microstructure, and permeation properties of supported zeolite (MFI) films and membranes prepared by secondary growth

Catalytic processes

S.N.V.K. Aki and **M.A. Abraham** 3533 Catalytic supercritical water oxidation of pyridine: kinetics and mass transfer

B. Balasubramanian, A. Lopez Ortiz, S. Kaytakoglu and **D.P. Harrison** 3543 Hydrogen from methane in a single-step process

J.F. Denayer, G.V. Baron, G. Vanbutsele, P.A. Jacobs and **J.A. Martens** 3553 Modeling of adsorption and bifunctional conversion of *n*-alkanes on Pt/H-ZSM-22 zeolite catalyst

G. Langhendries, G.V. Baron, P.E. Neys and **P.A. Jacobs** 3563 Liquid-phase hydrocarbon oxidation using supported transition metal catalysts: influence of the solid support

S. Hamoudi, K. Belkacemi and **F. Larachi** 3569 Catalytic oxidation of aqueous phenolic solutions catalyst deactivation and kinetics

M. Šetinc and **J. Levec** 3577 On the kinetics of liquid-phase methanol synthesis over commercial $Cu/ZnO/Al_2O_3$ catalyst

K.L. Ng, D. Chadwick and **B.A. Toseland** 3587 Kinetics and modelling of dimethyl ether synthesis from synthesis gas

S. Golay, L. Kiwi-Minsker, R. Doepper and **A. Renken** 3593 Influence of the catalyst acid/base properties on the catalytic ethanol dehydration under steady state and dynamic conditions. *In situ* surface and gas-phase analysis

G. Saracco, I. Cerri, V. Specchia and **R. Accornero** 3599 Catalytic pre-mixed fibre burners

A.C.S.C. Teixeira and **R. Giudici** 3609 Deactivation of steam reforming catalysts by sintering: experiments and simulation

Y. Schuurman, A. Pantazidis and **C. Mirodatos** 3619 The TAP-2 reactor as an alternative tool for investigating FCC catalysts

R.J. Meyer, D.I. Kim, D.T. Allen and **J.H. Jo** 3627 Catalytic hydrodechlorination of 1,3-dichloropropene

Catalytic reactors

Y.K. Park, N.E. Fernandes and **D.G. Vlachos** 3635 Effect of dilution on catalytic oxidation: model validation through experiments and predictions of operation regimes

R.V. Chaudhari, R. Jaganathan, S.H. Vaidya, S.T. Chaudhari, R.V. Naik and **C.V. Rode** 3643 Hydrogenation of diethyl maleate in a fixed-bed catalytic reactor: kinetics, reactor modelling and pilot plant studies

N.V. Dewachtere, F. Santaella and **G.F. Froment** 3653 Application of a single-event kinetic model in the simulation of an industrial riser reactor for the catalytic cracking of vacuum gas oil

J. Frauhammer, G. Eigenberger, L.v. Hippel and **D. Arntz** 3661 A new reactor concept for endothermic high-temperature reactions

W. Linghu, Z. Liu, Z. Zhu, J. Yang and **B. Zhong** 3671 Methanol synthesis in an integrated two-stage reactor

I. Mazzarino 3677 A comparative study of sandwich cross-flow and random catalytic packings for multiphase chemical reactors

V. Papavassiliou and **M.L. Wagner** 3683 Ballast gas for heat transfer control in fixed-bed reactors

K.G. Marnasidou, S.S. Voutetakis, G.J. Tjatjopoulos and **I.A. Vasalos** 3691 Catalytic partial oxidation of methane to synthesis gas in a pilot-plant-scale spouted-bed reactor

B.W. van Hasselt, H.P.A. Calis, S.T. Sie and **C.M. van den Bleek** 3701 Pressure drop characteristics of the three-levels-of-porosity reactor

P.L. Mills, H.T. Randall and **J.S. McCracken** 3709 Redox kinetics of $VOPO_4$ with butane and oxygen using the TAP reactor system

Number 17

M. Chanda and **G.L. Rempel** 3723 Gel-coated ion-exchange resin: a new kinetic model

M.P. Pedeferri, G. Zenoni, M. Mazzotti and **M. Morbidelli** 3735 Experimental analysis of a chiral separation through simulated moving bed chromatography

W. Luan, C.J. Lim, C.M.H. Brereton, B.D. Bowen and **J.R. Grace** 3749 Experimental and theoretical study of total and radiative heat transfer in circulating fluidized beds

R.O. Owen and **H.A. Chase** 3765 Modeling of the continuous counter-current expanded bed adsorber for the purification of proteins

K. Hou, M. Fowles and **R. Hughes** 3783 Potential catalyst deactivation due to hydrogen removal in a membrane reactor used for methane steam reforming

F. Pironti, D. Mizrahi, A. Acosta and **D. González-Mendizaba** 3793 Liquid–solid wetting factor in trickle-bed reactors: its determination by a physical method

I. Gohr Pinheiro, P. Schmitz and **D. Houi** 3801 Particle capture in porous media when physico-chemical effects dominate

W. Wu 3815 Adaptive nonlinear control of nonminimum-phase processes

M. Yokota, E. Takezawa, T. Takakusaki, A. Sato, H. Takahashi and **N. Kubota** 3831 Scale-up effect on the rate of contact nucleation caused by collisions of crystals with an impeller

S.J. Xu, W.J. Thomson 3839 Oxygen permeation rates through ion-conducting perovskite membranes

V.S. Vassiliadis, E.B. Canto and **J.R. Banga** 3851 Second-order sensitivities of general dynamic systems with application to optimal control problems

M. Song, A. Steiff and **P.-M. Weinspach** 3861 Direct-contact heat transfer with change of phase: a population balance model

M.C. Wang, D.S.H. Wong, H. Chen, W. Yan and **T.-M. Guo** 3873 Homotopy continuation method for calculating critical loci of binary mixtures

L.-S. Wang and **J. Gmehling** 3885 Improvement of the SRK equation of state for representing volumetric properties of petroleum fluids using Dortmund Data Bank

Y.H. Lee, D.M. Scott and **R.B. Thorpe** 3893 The scale-up of large bubbles attached to spargers in downward two-phase flow

Z.H. Wang and **G. Chen** 3899 Heat and mass transfer during low intensity convection drying

G. Farkas 3909 Kinetic lumping schemes

S.-Y. Lu 3917 Overall rate constants for dilute spheroid dispersions

M. Jenne and **M. Reuss** 3921 A critical assessment on the use of k–ε turbulence models for simulation of the turbulent liquid flow induced by a Rushton-turbine in baffled stirred-tank reactors

M. Kostoglou 3943 Theoretical analysis of the warm-up of monolithic reactors under non-reacting conditions

3955 Erratum

Number 18

E.J. Bissett and **S.H. Oh** 3957 Electrically heated converters for automotive emission control: determination of the best size regime for the heated element

S.M. Mahajani, M.M. Sharma and **T. Sridhar** 3967 Uncatalysed oxidation of cyclohexene

A.E. Kronberg and **K.R. Westerterp** 3977 Nonequilibrium effects in fixed-bed interstitial fluid dispersion

W.A.J. van Benthum, R.G.J.M. van der Lans, M.C.M. van Loosdrecht and **J.J. Heijnen** 3995 Bubble recirculation regimes in an internal-loop airlift reactor

S.A. Magrabi, B.Z. Dlugogorski and **G.J. Jameson** 4007 Bubble size distribution and coarsening of aqueous foams

M. Hamachi and **M. Mietton-Peuchot** 4023 Experimental investigations of cake characteristics in cross-flow microfiltration

W. Lin, S. Farroq and **C. Tien** 4031 Estimation of overall effective coefficient of heat transfer for nonisothermal fixed-bed adsorption

J. Wichterlová and **V. Rod** 4041 Dynamic behaviour of the mixer–settler cascade. Extractive separation of the rare earths

R. Sundar and **R.B.H. Tan** 4053 A model for bubble-to-jet transition at a submerged orifice

O. Floarea, T. Dobre and **S.V. Dinu** 4061 Mass transfer kinetics for interfacially perturbed vertical liquid films

R.J. Allgor and **P.I. Barton** 4065 Screening models for batch process development: Part II: Case studies

R. Wang, S. Farooq and **C. Tien** 4089 Maxwell–Stefan theory for macropore molecular–diffusion-controlled fixed-bed adsorption

I. Iliuta, F. Larachi and **B.P.A. Grandjean** 4099 Residence time, mass transfer and back-mixing of the liquid in trickle flow reactors containing porous particles

I.A. Karimi and **S. Farooq** 4111 Analysis of a tubular zeolite membrane process

4123 Book Review

Number 19

Y.H. Li, L.R. Radovic, G.Q. Lu and **V. Rudolph** 4125 A new kinetic model for the NO–carbon reaction

G. Drazer, R. Chertcoff, L. Bruno, M. Rosen and **J.P. Hulin** 4137 Tracer dispersion in packings of porous activated carbon grains

R.J. Allgor, L.B. Evans and **P.I. Barton** 4145 Screening models for batch process development. Part I: Design targets for reaction/distillation networks

L.V. Chong and **X.D. Chen** 4165 A mathematical model of the self-heating of spray-dried food powders containing fat, protein, sugar and moisture

K.-K. Tan and **R.B. Thorpe** 4179 The onset of convection induced by buoyancy during gas diffusion in deep fluids

G.D. Yadav and **M.S. Krishnan** 4189 Solid acid catalysed acylation of 2-methoxy-naphthalene: role of intraparticle diffusional resistance

G.J. Cheng, A.B. Yu and **P. Zulli** 4199 Evaluation of effective thermal conductivity from the structure of a packed bed

A.W. Pacek, S. Chamsart, A.W. Nienow and **A. Bakker** 4211 The influence of impeller type on mean drop size and drop size distribution in an agitated vessel

M.R. Rönnholm, J. Wärnå, T. Salmi, I. Turunen and **M. Luoma** 4223 Kinetics of oxidation of ferrous sulfate with molecular oxygen

Z.H. Wand and **G. Chen** 4233 Heat and mass transfer in fixed-bed drying

E.S. Wernersson and **C. Trägårdh** 4245 Scale-up of Rushton turbine-agitated tanks

Y.T. Puyate and **C.J. Lawrence** 4257 Effect of solute parameters on wick action in concrete

V. Alopaeus, J. Aittamaa and **H.V. Nordén** 4267 Approximate high flux corrections for multicomponent mass transfer models and some explicit methods

A.H.P. Skelland and **N.M. Hassan** 4273 Suspended solids distribution in agitated, baffled vessels containing three concentric cooling coils

G. Drazer, R. Chertcoff, L. Bruno and **M. Rosen** 4285 Concentration dependence of diffusion–adsorption rate in activated carbon

Number 20

SPECIAL ISSUE

PROCEEDINGS OF THE THIRD INTERNATIONAL CONFERENCE ON UNSTEADY STATE PROCESSES IN CATALYSIS, ST PETERSBURG, RUSSIA, 28 JUNE–3 JULY 1998

G.A. Bunimovich 4293 Preface

Y. Boudeville, M. Kolb, A. Pantazidis, C. Marquez-Alvarez, C. Mirodatos and **V. Elokhin** 4295 Monte-Carlo methods for simulating the catalytic oxidative dehydrogenation of propane over VMgO catalyst

S.L. Kiperman, N.A. Gaidai, N.V. Nekrasov, M.A. Botavina and **Sh.E. Duisenbaev** 4305 Unsteady-state studies of oxidation and hydrogenation catalytic processes

F. Genser and **S. Pietrzyk** 4315 Oxidative dehydrogenation of propane on V_2O_5/TiO_2 catalysts under transient conditions

L.G. Pinaeva, E.M. Sadovskaya, A.P. Suknev, V.B. Goncharov, V.A. Sadykov, B.S. Balzhinimaev, T. Décamp and **C. Mirodatos** 4327 On the oxygen effect in nitric oxide reduction by methane over Co/ZSM-5

M. Glikin, D. Kutakova and **E. Prin** 4337 Unsteady processes and aerosol catalysis

K. Rahkamaa and **T. Salmi** 4343 Investigation of the catalytic decomposition of NO and N_2O on supported Rh with transient techniques

N.I. Maksimova and **O.P. Krivoruchko** 4351 Study of thermocatalytic decomposition of polyethylene and polyvinyl alcohol in the presence of an unsteady-state Fe-containing catalyst

V.N. Tomilov, A.N. Zagoruiko and **P.A. Kuznetsov** 4359 Kinetic investigation and mathematical modeling of oscillation regimes for oxidative dehydrogenation of butene-1

D. Creaser, B. Andersson, R.R. Hudgins and **P.L. Silveston** 4365 Oxygen partial pressure effects on the oxidative dehydrogenation of propane

S.O. Shekhtman, G.S. Yablonsky, S. Chen and **J.T. Gleaves** 4371 Thin-zone TAP-reactor – theory and application

T. Gerlach and **M. Baerns** 4379 Application of the TAP-2 reactor and FTIR in elucidating the mechanism of NO_2 reduction by propene over an acidic mordenite

O. Dewaele, V.L. Geers, G.F. Froment and **G.B. Marin**	4385	The conversion of methanol to olefins: a transient kinetic study
H.W. Zanthoff, S.A. Buchholz, A. Pantazidis and **C. Mirodatos**	4397	Selective and non-selective oxygen species determining the product selectivity in the oxidative conversion of propane over vanadium mixed oxide catalysts
A. Hinz and **A. Andersson**	4407	Propane ammoxidation on an Al–Sb–V–W-oxide catalyst. A mechanistic study using the TAP-2 reactor system
T.A. Nijhuis, L.J.P. van den Broeke, M.J.G. Linders, J.M. van de Graaf, F. Kapteijn, M. Makkee and **J.A. Moulijn**	4423	Measurement and modeling of the transient adsorption, desorption and diffusion processes in microporous materials
D. Creaser, B. Andersson, R.R. Hudgins and **P.L. Silveston**	4437	Cyclic operation of the oxidative dehydrogenation of propane
T. Aida, D. Na-Ranong, R. Kobayashi and **H. Niiyama**	4449	Effect of diffusion and adsorption–desorption on periodic operation performance of NO–CO reaction over supported noble metal catalysts
J.H.B.J. Hoebink, A.J.L. Nievergeld and **G.B. Marin**	4459	CO oxidation in a fixed bed reactor with high frequency cycling of the feed
S. Golay, R. Doepper and **A. Renken**	4469	Reactor performance enhancement under periodic operation for the ethanol dehydration over γ-alumina, a reaction with a stop-effect
N.V. Vernikovskaya, A.N. Zagoruiko and **A.S. Noskov**	4475	SO_2 oxidation method. Mathematical modeling taking into account dynamic properties of the catalyst
F. van Neer and **A. Bliek**	4483	The feedback mechanism in self-oscillations for CO oxidation over EUROPT-3
J. Lauterbach, G. Bonilla and **T.D. Pletcher**	4501	Non-linear phenomena during CO oxidation in the mbar pressure range: a comparison between Pt/SiO_2 and Pt(100)
T. Ochs and **T. Turek**	4513	The mechanism of kinetic oscillations in the catalytic N_2O decomposition over Cu-ZSM-5
P. Ciambelli, A. Di Benedetto, R. Pirone and **G. Russo**	4521	Spontaneous isothermal oscillations in N_2O catalytic decomposition: fixed-bed reactor modelling
T.P. Pushkareva and **V.I. Bykov**	4529	The simple models of critical phenomena in the kinetic region and their parametric analysis
M. Sheintuch and **O. Nekhamkina**	4535	Pattern formation in homogeneous and heterogeneous reactor models
V.Z. Yakhnin and **M. Menzinger**	4547	Convective instability and its suppression in packed-bed- and monolith reactors

M. Skoglundh, P. Thormählen, E. Fridell, F. Hajbolouri and **E. Jobson** 4559 Improved light-off performance by using transient gas compositions in the catalytic treatment of car exhausts

G.C. Koltsakis and **A.M. Stamatelos** 4567 Modeling dynamic phenomena in 3-way catalytic converters

H. Wu, R. Rota, M. Morbidelli and **A. Varma** 4579 Parametric sensitivity in fixed-bed catalytic reactors with reverse-flow operation

K. Gosiewski, U. Bartmann, M. Moszczyński and **L. Mleczko** 4589 Effect of the intraparticle mass transport limitations on temperature profiles and catalytic performance of the reverse-flow reactor for the partial oxidation of methane to synthesis gas

S.G. Neophytides 4603 The reversed flow operation of a crossflow solid oxide fuel cell monolith

R. Quinta Ferreira, C. Almeida Costa and **S. Masetti** 4615 Reverse-flow reactor for a selective oxidation process

W.-D. Xiao, H. Wang and **W.-K. Yuan** 4629 Unsteady-state SO_2 converters with inter-stage heat removal

N.V. Vernikovskaya, A.N. Zagoruiko, N.A. Chumakova and **A.S. Noskov** 4639 Mathematical modeling of unsteady-state operation taking into account adsorption and chemisorption processes on the catalyst pellet

W.-D. Xiao, H. Wang and **W.-K. Yuan** 4645 Practical studies of the commercial flow-reversed SO_2 converter

J. Hanika 4653 Safe operation and control of trickle-bed reactor

J.G. Boelhouwer, H.W. Piepers and **A.A.H. Drinkenburg** 4661 Enlargement of the pulsing flow regime by periodic operation of a trickle-bed reactor

V.V. Kafarov, B. Mayorga and **C. Dallos** 4669 Mathematical method for analysis of dynamic processes in chemical reactors

Number 21

SPECIAL ISSUE

4TH INTERNATIONAL CONFERENCE ON GAS–LIQUID AND GAS–LIQUID–SOLID– REACTOR ENGINEERING, DELFT, THE NETHERLANDS, 23–25 AUGUST 1999

4679 Editorial

Plenaries

L.-S. Fan, G. Q. Yang, D. J. Lee, K. Tsuchiya and **X. Luo** 4681 Some aspects of high-pressure phenomena of bubbles in liquids and liquid–solid suspensions

Warsito, M. Ohkawa, N. Kawata and **S. Uchida** 4711 Cross-sectional distributions of gas and solid holdups in slurry bubble column investigated by ultrasonic computed tomography

D. Mewes, T. Loser and **M. Millies** 4729 Modelling of two-phase flow in packings and monoliths

Particle–Particle Interactions

L. Hagesaether, H. A. Jakobsen and **H. F. Svendsen** 4749 Theoretical analysis of fluid particle collisions in turbulent flow

J. Zahradník, M. Fialová and **V. Linek** 4757 The effect of surface-active additives on bubble coalescence in aqueous media

D. Colella, D. Vinci, R. Bagatin, M. Masi and **E. Abu Bakr** 4767 A study on coalescence and breakage mechanisms in three different bubble columns

M. H. Al-Rashed and **A. G. Jones** 4779 CFD modelling of gas–liquid reactive precipitation

Novelties in Catalytic Processes

L. Kiwi-Minsker, I. Yuranov, V. Höller and **A. Renken** 4785 Supported glass fibers catalysts for novel multi-phase reactor design

B. W. van Hasselt, P. J. M. Lebens, H. P. A. Calis, F. Kapteijn, S. T. Sie, J. A. Moulijn and **C. M. van den Bleek** 4791 A numerical comparison of alternative three-phase reactors with a conventional trickle-bed reactor. The advantages of countercurrent flow for hydrodesulfurization

D. W. F. Brilman, W. P. M. van Swaaij and **G. F. Versteeg** 4801 Gas–liquid–liquid reaction engineering: the Koch synthesis of pivalic acid from iso- and tert-butanol; reaction kinetics and the effect of a dispersed second-liquid phase

G. I. Horowitz, O. Martínez, A. L. Cukierman and **M. C. Cassanello** 4811 Effect of the catalyst wettability on the performance of a trickle-bed reactor for ethanol oxidation as a case study

Fundamentals of Bubble Motion

K. Sankaranarayanan, X. Shan, I. G. Kevrekidis and **S. Sundaresan** 4817 Bubble flow simulations with the Lattice Boltzmann method

K. Dewsbury, D. Karamanev and **A. Margaritis** 4825 Hydrodynamic characteristics of free rise of light solid particles and gas bubbles in non-Newtonian liquids

R. C. Chen, F.-M. Wang and **T.-J. Lin** 4831 Bubble wake dynamics of a single bubble rising in the freeboard of a two-dimensional liquid–solid fluidized bed

Complex Reactors

M. Díaz and **M. Martín** 4839 Mixing in batch G-L-L′ reactors with top and bottom blowing

K.-P. Zeyer, M. Mangold, T. Obertopp and **E. D. Gilles** 4845 An oscillating liquid-gas reaction with periodic evaporation: nonlinear analysis and experimental results

Bubbles from Nozzles

T.-J. Lin and **L.-S. Fan** 4853 Heat transfer and bubble characteristics from a nozzle in high-pressure bubble columns

G. M. Evans, G. D. Rigby, T. A. Honeyands and **Q. L. He** 4861 Gas dispersion through porous nozzles into down flowing liquids

Dynamics of Gas/Liquid Reactors

E. P. Van Elk, P. C. Borman, J. A. M. Kuipers and **G. F. Versteeg** 4869 Modelling of gas–liquid reactors — stability and dynamic behaviour of gas–liquid mass transfer accompanied by irreversable reaction

V. V. Ranade, J. A. M. Kuipers and **G. F. Versteeg** 4881 Gas-liquid reactor/separator: dynamics and operability characteristics

Advanced Experimental Techniques

Y. Kang, Y. J. Cho, K. J. Woo and **S. D. Kim** 4887 Diagnosis of bubble distribution and mass transfer in pressurized bubble columns with viscous liquid medium

S. Lefebvre and **C. Guy** 4895 Characterization of bubble column hydrodynamics with local measurements

R. Krishna, M. I. Urseanu, J. M. van Baten and **J. Ellenberger** 4903 Influence of scale on the hydrodynamics of bubble columns operating in the churn-turbulent regime: experiments vs Eulerian simulations

S. Lain, D. Bröder and **M. Sommerfeld** 4913 Experimental and numerical studies of the hydrodynamics in a bubble column

R. F. Mudde and **H. E. A. Van Den Akker** 4921 Dynamic behavior of the flow field of a bubble column at low to moderate gas fractions

S. Becker, H. De Bie and **J. Sweeney** 4929 Dynamic flow behaviour in bubble columns

Air Lift and Bubble Column Reactors

Š. Godó, J. Klein, M. Polakovič and **V. Báleš** 4937 Periodical changes of input air flowrate — a possible way of improvement of oxygen transfer and liquid circulation in airlift bioreactors

T. Saito, T. Kajishima, K. Tsuchiya and **S. Kosugi** 4945 Mass transfer and structure of bubbly flows in a system of CO_2 disposal into the ocean by a gas-lift column

H. Debellefontaine, S. Crispel, P. Reilhac, F. Périé and **J.-N. Foussard** 4953 Wet air oxidation (WAO) for the treatment of industrial waste-water and domestic sludge. Design of bubble column reactors

Three-Phase Fluidization

M. Safoniuk, J. R. Grace, L. Hackman and **C. A. McKnight** 4961 Use of dimensional similitude for scale-up of hydrodynamics in three-phase fluidized beds

J. Song, C. L. Hyndman, R. K. Jakher, K. Hamilton and **A. Kantzas** 4967 Fundamentals of hydrodynamics and mass transfer in a three-phase fluidized bed system

C.L. Briens, Y. A. A. Ibrahim, A. Margaritis and **M. A. Bergougnou** 4975 Effect of coalescence inhibitors on the performance of three-phase inverse fluidized bed columns

Heat and Mass Transfer

G. M. Evans and **P. M. Machniewski** 4981 Mass transfer in a confined plunging liquid jet bubble column

A. W. Kleingeld, L. Lorenzen and **F. G. Botes** 4991 The development and modelling of high intensity impinging stream jet reactors for effective mass transfer in heterogeneous systems

C. Marcandelli, G. Wild, A. S. Lamine and **J. R. Bernard** 4997 Measurement of local particle-fluid heat transfer coefficient in trickle-bed reactors

Aerated Slurries in Reactors and Separators

M. A. Bennett, R. M. West, S. P. Luke, X. Jia and **R. A. Williams** 5003 Measurement and analysis of flows in a gas–liquid common reactor

G. P. van der Laan, A. A. C. M. Beenackers and **R. Krishna** 5013 Multicomponent reaction engineering model for Fe-catalyzed Fischer–Tropsch synthesis in commercial scale slurry bubble column reactors

J. G. Khinast, D. Luss, T. M. Leib and **M. P. Harold** 5021 The boiling slurry reactor: axial dispersion model

Trickle Beds

A. Attou and **G. Ferschneider** 5031 A two-fluid model for flow regime transition in gas–liquid trickle-bed reactors

I. Iliuta and **F. Larachi** 5039 The generalized slit model: pressure gradient, liquid holdup and wetting efficiency in gas–liquid trickle flow

B. W. van Hasselt, H. P. A. Calis, S. T. Sie and **C. M. van den Bleek** 5047 Gas- and liquid-phase residence time distribution in the three-levels-of-porosity reactor

CFD Simulations of Multiphase Flows

S. S. Thakre and **J. B. Joshi** 5055 CFD simulation of bubble column reactors: importance of drag force formulation

R. F. Mudde and **O. Simonin** 5061 Two and three dimensional simulations of a bubble plume using a two-fluid model

J. Sanyal, S. Vásquez, S. Roy and **M. P. Dudukovic** 5071 Numerical simulation of gas–liquid dynamics in cylindrical bubble column reactors

A. Cockx, Z. Do-Quang, A. Liné and **M. Roustan** 5085 Use of computational fluid dynamics for simulating hydrodynamics and mass transfer in industrial ozonation towers

D. Pfleger, S. Gomus, N. Gilbert and **H.-G. Wagner** 5091 Hydrodynamic simulations of laboratory scale bubble columns fundamental studies of the Eulerian–Eulerian modelling approach

Y. Li, J. Zhang and **L.-S. Fan** 5101 Numerical simulation of gas–liquid–solid fluidization systems using a combined CFD-VOF-DPM method: bubble wake behavior

M. Bauer and **G. Eigenberger** 5109 A concept for multi-scale modeling of bubble columns and loop reactors

Monolith Reactors

P. J. M. Lebens, J. J. Heiszwolf, F. Kapteijn, S. T. Sie and **J. A. Moulijn** 5119 Gas–liquid mass transfer in an internally finned monolith operated countercurrently in the film flow regime

Packed Beds

P. Spicka, A. A. Martins, M. M. Dias and **J. C. B. Lopes** 5127 Hydrodynamics of gas–liquid flow in 2D packed/unpacked rectangular reactor

A. Attou and **G. Ferschneider** 5139 A simple model for pressure drop and liquid hold-up in packed-bed bubble reactors

A. P. Higler, R. Krishna, J. Ellenberger and **R. Taylor** 5145 Counter-current operation of a structured catalytically packed-bed reactor: liquid phase mixing and mass transfer

Posters

M. Letzel and **A. Stankiewicz** 5153 Gas hold-up and mass transfer in gas-lift reactors operated at elevated pressures

E. Delnoij, J. Westerweel, N. G. Deen, J. A. M. Kuipers and **W. P. M. van Swaaij** 5159 Ensemble correlation PIV applied to bubble plumes rising in a bubble column

S. D. Kim, J.-S. Kim, C.-H. Nam, S.-H. Kim and **Y. Kang** 5173 Immersed heater-to-bed heat transfer in liquid–liquid–solid fluidized beds

H. Kojima, J. Sawai, H. Uchino and **T. Ichige** 5181 Liquid circulation and critical gas velocity in slurry bubble column with short size draft tube

R. Pohorecki, W. Moniuk and **A. Zdrójkowski** 5187 Hydrodynamics of a bubble column under elevated pressure

E. Y. Kenig, R. Schneider and **A. Górak** 5195 Rigorous dynamic modelling of complex reactive absorption processes

J. Hanika, J. Kolena and **Q. Smejkal** 5205 Butylacetate via reactive distillation — modelling and experiment

N. Bendjaballah, H. Dhaouadi, S. Poncin, N. Midoux, J.-M. Hornut and **G. Wild** 5211 Hydrodynamics and flow regimes in external loop airlift reactors

M. Ruzicka, J. Drahoš, J. Zahradník and **N. H. Thomas** 5223 Natural modes of multi-orifice bubbling from a common plenum

H. Yamada, H. Urano and **S. Goto** 5231 Selective hydrogenation of unsaturated aldehyde in gas–liquid–liquid–solid four phases

V. V. Ranade and **R. P. Utikar** 5237 Dynamics of gas–liquid flows in bubble column reactors

A. Couvert, M. Roustan and **P. Chatellier** 5245 Two-phase hydrodynamic study of a rectangular air-lift loop reactor with an internal baffle

C. Freitas, M. Fialová, J. Zahradník and **J. A. Teixeira** 5253 Hydrodynamic model for three-phase internal- and external-loop airlift reactors

T. Yano, K. Kuramoto, A. Tsutsumi, K. Otawara and **Y. Shigaki** 5259 Scale-up effects in nonlinear dynamics of three-phase reactors

H. Li and **A. Prakash** 5265 Analysis of bubble dynamics and local hydrodynamics based on instantaneous heat transfer measurements in a slurry bubble column

R. L. Sonolikar, G. V. Butley and **S. Pentu Saheb** 5273 Gas holdup in a three-phase magneto-fluidized bed

E. F. Stefoglo, O. P. Zhukova, I. V. Kuchin, S. N. Albrecht, A. T. Nagirnjak and **L. Van Dierendonck** 5279 Reaction engineering of catalytic gas-liquid processes in loop-venturi reactors in comparison with stirred vessels operation

K. Muroyama, T. Norieda, A. Morioka and **T. Tsuji** 5285 Hydrodynamics and computer simulation of an ozone oxidation reactor for treating drinking water

W. G. Yang, J. F. Wang, W. Chen and **Y. Jin** 5293 Liquid phase flow structure and backmixing characteristics of gas–liquid–solid three-phase circulating fluidized bed

J.A. Orejas 5299 Modelling and simulation of a bubble-column reactor with external loop: application to the direct chlorination of ethylene

M. H. H. Van Dam, J.-P. Corriou, N. Midoux, A.-S. Lamine and **C. Roizard** 5311 Modelling and measurement of sulfur dioxide absorption rate in a laminar falling film reactor

B. Waldie, T. Johnston, W. K. Harris and **C. Bell** 5319 Bubble characteristics in a high intensity gas/liquid contactor

I. Iliuta, A. Ortiz-Arroyo, F. Larachi, B. P. A. Grandjean and **G. Wild** 5329 Hydrodynamics and mass transfer in trickle-bed reactors: an overview

T. S. Pham, D. Pinson, A. B. Yu and **P. Zulli** 5339 Gas–liquid–powder flow in moving particles: operational and non-operational regimes

M. Tobajas, E. García-Calvo, M. H. Siegel and **S. E. Apitz** 5347 Hydrodynamics and mass transfer prediction in a three-phase airlift reactor for marine sediment biotreatment

Number 22

SPECIAL ISSUE

SYMPOSIUM IN PRINT

CIRCULATING FLUIDIZED BEDS (CFB) – PAST, PRESENT AND FUTURE

M. Kwauk and **J. Li** 5355 Preface

L. Reh 5359 Challenges of circulating fluid-bed reactors in energy and raw materials industries

E.H. van der Meer, R.B. Thorpe and **J.F. Davidson** 5369 Dimensionless groups for practicable similarity of circulating fluidised beds

J. Sternéus, F. Johnsson, B. Leckner and **G.I. Palchonok** 5377 Gas and solids flow in circulating fluidized beds — discussion on turbulence

M.L. Mastellone and **U. Arena**	5383	The effect of particle size and density on solids distribution along the riser of a circulating fluidized bed
E.-U. Hartge, K. Luecke and **J. Werther**	5393	The role of mixing in the performance of CFB reactors
J. Li, C. Cheng, Z. Zhang, J. Yuan, A. Nemet and **F.N. Fett**	5409	The EMMS model — its application, development and updated concepts
J. Ouyang and **J. Li**	5427	Discrete simulations of heterogeneous structure and dynamic behavior in gas–solid fluidization
J. Liu, J.R. Grace, H. Bi, H. Morikawa and **J. Zhu**	5441	Gas dispersion in fast fluidization and dense suspension upflow
A.S. Issangya, D. Bai, H.T. Bi, K.S. Lim, J. Zhu and **J.R. Grace**	5451	Suspension densities in a high-density circulating fluidized bed riser
H. Zhang, J.-X. Zhu and **M.A. Bergougnou**	5461	Hydrodynamics in downflow fluidized beds (1): solids concentration profiles and pressure gradient distributions
P. Lehner and **K.-E. Wirth**	5471	Characterization of the flow pattern in a downer reactor
P. Schlichthaerle and **J. Werther**	5485	Axial pressure profiles and solids concentration distributions in the CFB bottom zone
W. Lin, C.E. Weinell, P.F.B. Hansen and **K. Dam-Johansen**	5495	Hydrodynamics of a commercial scale CFB boiler — study with radioactive tracer particles
Y. Fujima, S. Deguchi and **T. Endo**	5507	Simulation for solid concentration profile in CFB with different fluid/solid density ratios
A. Schmidt and **U. Renz**	5515	Eulerian computation of heat transfer in fluidized beds
W. Yang, J. Wang, L. Zhou and **Y. Jin**	5523	Gas–liquid mass transfer behavior in three-phase CFB reactors
J.C. Chen	5529	Experiments that address phenomenological issues of fast fluidization
J. van der Schaaf, F. Johnsson, J.C. Schouten and **C.M. van den Bleek**	5541	Fourier analysis of nonlinear pressure fluctuations in gas–solids flow in CFB risers — observing solids structures and gas/particle turbulence
P. Basu	5547	Combustion of coal in circulating fluidized-bed boilers: a review
J.P. Jacobs	5559	The future of fluidized-bed combustion
S. Rajaram	5565	Next generation CFBC
A. Lyngfelt and **B. Leckner**	5573	Sulphur capture in circulating fluidized-bed boilers: can the efficiency be predicted?

L.-S. Fan, P. Jiang, R. Agnihotri, S.K. Mahuli, J. Zhang, S. Chauk and **A. Ghosh-Dastidar** 5585 Dispersion and ultra-fast reaction of calcium-based sorbent powders for SO_2 and air toxics removal in coal combustion

K. Tagashira, I. Torii, K. Myouyou, K. Takeda, T. Mizuko and **Y. Tokushita** 5599 Combustion characteristics and dioxin behavior of waste fired CFB

H. Li, R. Hong and **Z. Wang** 5609 Fluidizing ultrafine powders with circulating fluidized bed

K.N. Theologos, A.I. Lygeros and **N.C. Markatos** 5617 Feedstock atomization effects on FCC riser reactors selectivity

R.M. Contractor 5627 Dupont's CFB technology for maleic anhydride

Number 23

I. Iliuta, F. Larachi, B. P. A. Grandjean and **G. Wild** 5633 Gas–liquid interfacial mass transfer in trickle-bed reactors: state-of-the-art correlations

A. Serbezov and **S. V. Sotirchos** 5647 Particle-bed model for multicomponent adsorption-based separations: application to pressure swing adsorption

S. Liu and **D. Li** 5667 Drop coalescence in turbulent dispersions

C. Antoniades and **P. D. Christofides** 5677 Feedback control of nonlinear differential difference equation systems

M. Song and **X.-J. Qiu** 5711 An alternative to the concept of the interval of quiescence (IQ) in the Monte Carlo simulation of population balances

R. M. Wu and **D. J. Lee** 5717 Highly porous sphere moving through centerline of circular tube filled with Newtonian fluid

S. Laborie, C. Cabassud, L. Durand-Bourlier and **J. M. Lainé** 5723 Characterisation of gas–liquid two-phase flow inside capillaries

D. Rong, T. Mikami and **M. Horio** 5737 Particle and bubble movements around tubes immersed in fluidized beds – a numerical study

W. Zhixiang, M. Fenzhu, S. Yiqiang, Z. Ming and **Y. Guocong** 5755 A method for the measurement of gas concentration distribution in the adsorptive bed

E. T. Tudose and **M. Kawaji** 5761 Experimental investigation of Taylor bubble acceleration mechanism in slug flow

I. Hodgson and **C. Oloman** 5777 Pressure gradient, liquid hold-up and mass transfer in a graphite fibre bed with cocurrent upward gas–liquid flow

Shorter Communication

Z. Wang 5787 Effect of adsorbent shape on adsorption dynamics in a batch adsorber

Number 24

C. T. Goralski Jr. and **L. D. Schmidt** 5791 Modeling heterogeneous and homogeneous reactions in the high-temperature catalytic combustion of methane

Y. Kaneko, T. Shiojima and **M. Horio** 5809 DEM simulation of fluidized beds for gas-phase olefin polymerization

F. Luna and **J. Martínez** 5823 Stability analysis in multicomponent drying of homogeneous liquid mixtures

J. Yu, H. Liu and **J. Chen** 5839 "Modified flocculation" of protein with a combination of anionic copolymer and polyacrylamide

M. Fullana, F. Trabelsi and **F. Recasens** 5845 Use of neural net computing for statistical and kinetic modelling and simulation of supercritical fluid extractors

J. F. Porter, G. McKay and **K. H. Choy** 5863 The prediction of sorption from a binary mixture of acidic dyes using single- and mixed-isotherm variants of the ideal adsorbed solute theory

V. Alopaeus, J. Koskinen and **K. I. Keskinen** 5887 Simulation of the population balances for liquid–liquid systems in a nonideal stirred tank. Part 1: Description and qualitative validation of the model

H. Abou-Chakra and **U. Tüzün** 5901 Coefficient of friction of binary granular mixtures in contact with a smooth wall. Part I: Direct shear box measurements of the effects of particle size ratio and particle surface roughness

H. Abou-Chakra and **U. Tüzün** 5913 Coefficient of friction of binary granular mixtures in contact with a smooth wall. Part B: Micro-structural model describing the effects of packing fraction and load distribution on the wall friction of smooth, elastic spheres

O. Borchers, C. Busch, A. Sokolichin and **G. Eigenberger** 5927 Applicability of the standard k–ε turbulence model to the dynamic simulation of bubble columns. Part II: Comparison of detailed experiments and flow simulations

III List of Contents

XXXIX Author Index